LASERCRAFT
SENSING THE FUTURE

5680 Oakbrook Parkway □ Suite 149
Norcross, GA 30093
PH: 770-409-9660
FAX: 770-409-9649

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Jerome Dennis
Dockets Management Branch, (HFA-305)
Food and Drug Administration
5630 Fishers Lane, Room 1061
Rockville, MD 20852

Dear Mr. Dennis:

I am writing in regard to the proposed amendment to the Laser Products Performance Standard.

LaserCraft manufactures the ProLaser series of police laser speed guns. We typically sell these devices to Kustom Signals, Inc., Lenexa, KS who then distributes them domestically and internationally. We have sold these devices since 1991 and to date I have not received confirmation of any incident regarding the laser safety of the device. I would estimate that there are at least 4,000 ProLaser speeds guns in use today. I believe these laser speed guns have revolutionized the ability of an Officer to accurately and safely enforce speed limits throughout the United States.

As I understand the current proposed amendment, the required reduction in our output power would mostly likely degrade the performance of our ProLaser to the point that we would lose most if not all of are market share to the older microwave radar devices. Because the ProLaser line accounts for easily 90% of our revenue, this would clearly have a devastating effect upon our company.

First, I would like to list the effect of the new standard on the new ProLaser III (PLIII) product line. The PLIII is very similar to the previous ProLaser units. The repetition rate was dropped from 238 Hz. To 200 Hz. and the transmit aperture size was decreased from 40mm to 38 mm. The pulse width of 20 ns and wavelength of 905nm are the same. The PLIII uses a stacked laser diode array that looks something like the following under magnification:

93N-0044

C28

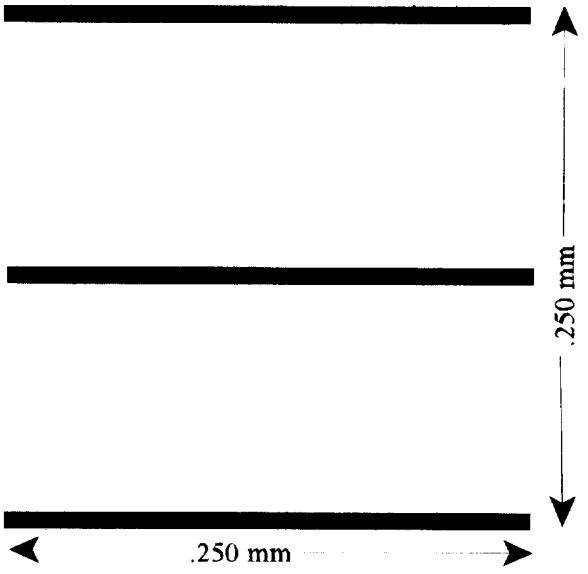

Figure 1 - Laser Source

The laser parameters are:

- wavelength: 905 +/- 10 nm
- pulse width: 20 ns
- pulse rate: 200 Hz.
- output aperture size: 38mm
- apparent source size is 3 x 3 milliradian as viewed from the output aperture. Laser is placed at focal plane of lens with 83.33 mm effective focal length.

Under the current standard, the following calculations apply for Class 1 lasers:

$$AEL = 3.9 \times 10^{-7} k_1 k_2 \text{ Watts}$$

where,

$$k_1 = 10^{[(895-700)/515]} = 2.41$$

$$k_2 = 100 \text{ for } t>10{,}000$$

and

$$AEL = 94 \times 10^{-6} \text{ Watts (through a 7 mm test aperture).}$$

We currently have a self imposed maximum setting of about 20×10^{-6} Watts through a 7 mm aperture. This is in line with the previous ProLaser devices. Now, there is typically about 10 times more power through the entire 38 mm transmit aperture for a maximum total self imposed limit of 200×10^{-6} Watts, total aperture. Note that if we adjusted the ProLaser to the maximum AEL for 7 mm, the total aperture output would be approximately 940×10^{-6} Watts. I will convert

these numbers to Joules so that they can be more easily compared to the proposed standard. *Also, the ProLaser's performance is determined essentially from the per pulse energy.*

- AEL (joules per pulse) = 470 nJ (through 7 mm aperture)
- LaserCraft self imposed limit = 100 nJ (through 7 mm aperture)
- Total aperture output using AEL = 4,700 nJ
- Total aperture output limit by LaserCraft = 1,000 nJ

Under the proposed amendments I calculate the following:

$AEL_{prop} = 2 \times 10^{-7} C_4C_5C_6$ Joules/pulse

Where,

$C_4 = 10^{.002(895-700)} = 2.455$

$C_5 = N^{-.25} = [(200)(100)]^{-.25} = .084$

$C_6 = \alpha / \alpha_{min} = 3.0 / 1.5 = 2.0$

Note: The calculation of C_6 is not straight forward due the "stripe array" nature of our source. If we are permitted to use the overall dimensions, the value here is correct. However, if the stripes must be examined individually, the calculation may change.

Then the new AEL is:

AEL_{prop} = 82 nJ (through a 50 mm aperture)

This represents a whopping 98% reduction in the effective allowed output power of the ProLaser when compared to the current standard!

Even using our previous self imposed limit on total output energy, we are still looking at a reduction from 1000 nJ to 82 nJ. With this output energy, the ProLaser is virtually useless in the United States.

I cannot believe that this is the intent of the proposed amendment.

The source we are using is gigantic by normal laser standards; much closer in some respects to an LED. The beam divergence for our system is set by the source size, not by defocusing a more collimated beam. When viewed by any optical gain device with larger collecting optics, the image of our source on the retina will increase proportionally. Thus it is physically impossible to increase the energy density on the retinal by using collection optics.

In general I certainly agree with the premise of the "$N^{-.25}$" rule. However, I believe systems like the ProLaser containing large collimated sources, yielding large angular source sizes should not be subjected to large aperture measurements.

Another way to look at this is as follows:

I can manufacture a laser gun with 82 nJ per pulse energy and with exactly the same laser parameters (including apparent source size= 3mr) except with a 7mm transmit aperture diameter. And the new standard would say that this system is equally as safe as a system where the transmit beam is 38 mm in diameter. This is simply not the case; the 38 mm diameter system is far safer with or without optical viewing devices.

I would like to discuss this matter further in this document and propose some ideas, however, I must rush to submit this before the deadline.

I would ask that the current proposed amendment be reviewed regarding the application of the 50 mm collection optic.

Sincerely,

Scott Patterson
President

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